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*recommened optics +  
how to write specs?*

RETYPE-10 June 1968(c1)  
TSSG/TSD-040/68  
1 April 1968

MEMORANDUM FOR: Chief, Development and Engineering Division,  
TSSG/NPIC

SUBJECT: Modifications for [ ] Trichromatic Micro-  
densitometer

1. The [ ] Trichromatic Microdensitometer in TSSG/TSD is not producing data that is compatible with state-of-the-art analysis techniques. This deficiency results from the restraints imposed by the available sampling rates, by the minimum scan length, and by a discrepancy in the color focus.

2. In the present configuration, the instrument can provide only one digitized sample per micron distance traveled. Based on the response (approximately 100 cycles per millimeter) of the present photographic systems, the current analysis techniques require data at a rate of at least two samples per micron. Future systems are expected to respond at approximately 250 cycles per millimeter which would then require a sampling rate of at least 4 samples per micron. These sampling rates are required in order to satisfy the condition imposed by the Weddle Rule for numerical integration. This rule requires at least six samples per resolution element at the smallest interval present. The report on Image Assessment Research as performed by [ ] illustrates the advantages of the Weddle technique over other methods of numerical integration.

3. The length of a scan or a series of raster scans on the instrument is controlled and limited by mechanical switches. Because of physical proximity, the switches limit the minimum scan length to 2,500 microns. At the scale of present imagery, these 2,500 microns may represent a ground distance of 2,500 feet. Most of the objects which are analyzed range from 1 to 200 feet on the ground. Obviously then, excessive data is generated and digitized by the instrument. Since this excessive data does not improve the accuracy of the computations and, in fact, is not necessary for the computations, the effective use of the computer programs is compromised. Logic dictates that only the area of interest be traced and unnecessary data excluded.

Declass Review by NGA/DOD

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4. Trichromatic traces of a special test object (supplied by [redacted]) revealed that the instrument cannot be focused in three colors, simultaneously, at a single point. This discrepancy is apparently a function of the optics supplied with the instrument. Designed for use at a tube length of approximately 10 inches, the microscope lenses must presently be used at the microdensitometer's tube length of 18 inches. This inconsistency causes the failure in focusing each color at the same point along the optical axis. A second problem is apparently caused by a misalignment of the system apertures with respect to the optical axis. This misalignment produces a lateral shift in the best focus for each color.

5. When considered with respect to the need for a more objective assessment of operational imagery and systems, the recent advances in state-of-the-art analysis techniques and the anticipated availability of NPIC computer programs imply that the [redacted] Trichromatic Microdensitometer be modified to correct the existing deficiency. The lack of optimum data denies the analyst and/or the interpreter an opportunity to perform at maximum potential. Because NPIC does possess the sophisticated instrumentation and has perhaps the most rapid access to original negatives, an inherent capability cannot be fully realized due to insufficient data-analysis techniques. The lack of sufficient and necessary data assumes added significance, particularly in those situations where microdensitometric traces are a last-resort aid to interpretation. Based on the increasing use of densitometric data by both the industry and the procurement agencies, NPIC would not be able to remain consistent with the external standards which form the common basis for evaluations/comparisons. With the intent of improving the NPIC capability for producing quality results, the suggested modifications are submitted for your consideration, hopeful concurrence, and initiating action.

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[redacted signature box]

Chief, Technical Services Division  
TSSG/NPIC

Distribution:

- Orig. -- NPIC/TSSG/DED
- 1 -- NPIC/TSSG
- 1 -- NPIC/TSSG/TSD 2 - Chrono 4/68

NPIC/TSSG/TSD [redacted] pdc/[redacted] (1 April 1968)

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